Chapter 3
The Comparison between WLAN and Femtocell

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ABSTRACT
Wireless access techniques are continuously expanding their transmission bandwidth, coverage, and Quality of Service (QoS) support in recent years. With the huge market success of Wireless Local Area Networks (WLANs), the new-generation wireless technique Femtocell has now been standardized and accordingly deployed. Generally, Femtocells are common cellular air access technologies. However, according to Shannon’s law, the only way to maintain and to improve the system capacity is by shortening the distance between the transmitter and the receiver, hence, improving the signal-to-noise ratio. Femtocell(s) expand network coverage, and provide a dedicated wireless capacity to enable mobile services at indoor environments.

The communication link of femtocell may be one of Wide Area Network (WAN) technologies, such as, Asymmetric Digital Subscriber Line (ADSL). Femtocell used a public network to establish connectivity between femtocell and core network elements where there are a set of challenges to the operators. However, femtocells use IP Network as a backhaul architecture instead of conventional cellular network infrastructure, so that Femtocells and WiFi infrastructure networks can come to a compromise as they have a lot of common iterative and inter-related technologies and activities. This raises the question as to whether femtocell technology will substitute the existing WiFi technology. By carefully analyzing the similarities and differences between the two technologies one can find this answer. This chapter provides a technical comparison between Femtocells and WiFi in terms of architecture, operation, and standards.

DOI: 10.4018/978-1-4666-0092-8.ch003
INTRODUCTION

Femtocell is a Fixed Mobile Convergence (FMC) that has come up with a solution for higher data rates and improved system performance for future wireless networks, such as, World Wide Interoperability for Microwave Access (WiMAX), the third Generation Partnership Project’s (3GPP), High Speed Packet Access (HSPA) and Long Term Evolution Standard (LTE) (Eiko, 2011). Wire- less has introduced many technologies, such as, cellular systems which cater primarily for voice services with mobility. WLANs were developed as an extension to terrestrial LANs to provide network connectivity with restricted mobility. While cellular networks consist of a dedicated terrestrial backbone, WLANs usually connect directly to IP networks through Digital Subscriber Loop (DSL) or Ethernet backbone network. Femtocell, a small base station, is a logical extension to a cellular network usually designed for use in a home or small business. It allows service providers to extend their service coverage by connecting to their network via broadband, such as, DSL or cable. Current design typically supports 2 to 4 active mobile phones in a residential setting, and 8 to 16 active mobile phones in enterprise settings. Nowadays, much concentration is focused on WCDMA. Interestingly, this concept is pertinent to GSM, CDMA2000, TD-SCDMA, WiMAX and LTE solutions. In the case of a mobile operator, femtocell is more attractive because of the improvements in coverage and capacity, especially, indoors. This reduces both capital expenditure and operating expenses that provide a better service to the end users and which in turn reduces the overheads. Basically, Femtocells creates an alternative way to distribute the benefits of Fixed Mobile Convergence (FMC) (Zhang, 2010).

At present there is a fascinating race between Femtocells and WiFi technologies that come close to the same goal from different directions. Voices over WiFi for cell phones are competing with Femtocells but Femtocells may win due to its technological strength and stability. WLAN is well established and standardized; on the other hand WiFi industry is quite mature while femtocells are still new. With the introduction of femtocell technology, cellular systems come closer to WiFi in terms of architecture, operating frequency, services offered, data rates and support. However, there are some issues that distinguish each of them and will consequently lead to the acceptance of one technology over the other.

TECHNICAL FEATURES FOR WIFI AND FEMTOCELL

Network Convergence and Interworking

A network convergence refers to using a single interface and a single backbone network for a variety of telecommunication services, for example, voice, video and data. Provisioning of multiple services by means of a network convergence has shown benefits for businesses in terms of cost and user productivity. The concept of network convergence evolved through a circuit switched Integrated Services Digital Network (ISDN), and gradually migrated to the Packet Switched networks, initially, Asynchronous Transfer Mode (ATM) based broadband ISDN, and ultimately IP based Internet. The main objective of advancing in the network convergence is to achieve an IP convergence in the form of All IP Networks (AIPNs). The AIPNs not only provide data, video and voice services over a single IP network but also facilitate connectivity to other external networks (Frizer, 2011).

In this way, users can achieve ubiquitous connectivity independent of devices and locations. The Fixed-Mobile Convergence (FMC) is a popular trend in market and allows seamless connectivity between fixed and mobile telephone networks. Service providers can bring all potential wireless and wired users under their realm.